April-May 1973

EMO

Emergency Measures in Canada's North

Disasters Past and Future

Surrey County Flood Warning

Seeking Nuclear Arms Control

Warsaw Pact Military Power

CANADA EMERGENCY MEASURES ORGANIZATION

EMO
NATIONAL DIGEST

Published by

Canada Emergency Measures Organization, Ottawa, Ont.

Department of National Defence

National Coordinator: C. R. PATTERSON

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Editor: A. M. STIRTON

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EMERGENCY MEASURES IN CANADA'S NORTH

Factors which tend toward an increase in the vulnerability of a community have long been identified — obvious physical factors such as increasing size and increasing complexity — isolation, poor logistics, extreme climate and so on. Among the smaller Arctic communities there is another factor which is an historic memory in southern Canada — the emergence of self-government at the local level. Tragic and disastrous events which, a short time ago, were accepted with resignation are now the business of the community and, significiently, the business of the newly formed Settlement Councils.

As the formal structure of Local Government rises at an astonishing rate, responsibilities such as the need for emergency measures are willingly accepted by a people who have walked a tightrope called survival for ten thousand years.

The following article was published in "Just-A-Minute" one of four Territorial publications which appear regularly in the North.

This is one of many ways in which the technique and methodology of the development of self-government are put in the hands of people, willing and able to use them — for the last time in the western world.

Dan Billing, Emergency Planning Officer, Yukon and Northwest Territories

Be Prepared for Disasters

Every year in the Northwest Territories there are a few disasters.

At Pangnirtung a *windstorm* knocked down half a dozen houses; Pond Inlet was left without power for many hours in winter; forest fires cut off the *Mackenzie Highway* and telephone lines; *floods* threatened Fort Simpson — all these occurred within the last year.

Some emergencies can be predicted. Forest fires, strong winds, and floods are expected in some areas at certain times of the year.

But who can predict a plane crash, a mine cave-in, a serious building fire, an epidemic disease?

Sometimes even predictable situations can be a surprise, for example, Inuvik was in danger from a forest fire several years ago, which is unusual so far north.

The only way to stop a disaster from having a serious or lasting bad effect on your community is to be completely prepared for whatever might happen.

When there's an emergency, doing everything quickly and well becomes most important. Delay can cost lives and money. The usual steps for deciding matters, like voting in the community council, are too slow.

Stopping the emergency, like putting out a fire, or cleaning up afterwards so people can go back to normal, as after a flood, must be done quickly.

To do this, the important people in the community must know exactly what they're expected to do in different emergency situations.

The community council should organize everything. Volunteers like fire chiefs, and professionals like nurses, power plant operators, social workers, and industry and development men, should work in cooperation with them.

The fire chief would take the lead *in a bad fire.* Nurses and doctors would work to end an outbreak of hepatitis or meningitis or measles. Forestry workers take charge of forest fires. Social workers arrange for supplying food, clothing, and shelter when it's necessary.

The territorial government sends a book of instructions to every one of these people in all communities in the Northwest Territories so they know what to do. Situations are different in each settlement, so the book can't go into detail. Fighting a forest fire, for instance, is a lot different from fighting a house fire in the high arctic. So the book just gives a general idea how fires should be fought, and what to do afterwards.

The book tells these people the first thing they should do is choose a place to meet if there's disaster, to decide what to do. They should have a second choice in case the first one is destroyed or can't be reached.

If these people, called the Emergency Planning Committee, decide they can't handle things alone, they can call on other communities or outside groups for help.

Emergency health services, including a whole portable hospital that can be flown in by a Hercules, are kept ready in Edmonton by the Northern Health Services.

Soldiers can be sent in from Yellowknife or the south to fight fires or floods. Hercules aircraft can be used to evacuate a whole settlement at one time.

People from the northern communities can take courses in disaster work. There are courses for fire chiefs, and nurses can take a two-week course in handling disasters.

Ordinary people too, can take courses in first aid,

which can save lives of people hurt in an accident, or bitten by a dog.

Communities in the Northwest Territories have always been able to deal with emergencies efficiently in the past, because their isolation makes them self-reliant. Everybody wants to help when there's a disaster because they know it will make life easier for everyone in the community.

Keeping the Communities Informed

Emergency Measures Organization

No community is exempt from disaster and no one can estimate precisely when or in what form a disaster may strike. Within the limits of these assumptions however there is a great deal which can be done to reduce the effects of disaster by preplaning.

Every community must be prepared to re-act to emergency conditions and to avoid all possible sufferings and loss. Therefore, it is the job of the Emergency Measures Committee to give leadership in a disaster situation.

Civil Emergency Planning

CEP is planning undertaken by Government delegated agencies at Federal, Provincial, Territorial, and Municipal level for those emergency rising out of a war or peacetime disaster.

The peacetime disaster most likely to occur are;

— Fire
— Floods
— Earthquake
— Epidemic
— Hurricane
— Tornado
— Shipwreck
— Fishing Disaster
— Mine Accident
— Tidal Waves
— Nuclear Accident
— Hazardous Chemicals
— Environmental Emergencies
— Transportation Disaster
— Road or Bridge Washout
— Extreme Snow or Ice Conditions
— Loss of Electrical Power or Heating Facilities

The wartime emergency would result from an attack of this continent.

Direction and Conditions

When a disaster occurs or is imminent the Disaster Control Committee should immediately assemble to pass the word on. The Committee should function under the Chairman and take the necessary action to ensure the protection of life and property. If on being informed the Commissioner appoints an officer to take over all charge on his behalf, the Committee should function under the direction of this officer. This officer will then by designated as the Disaster Site Controller.

Disaster Committee

The following is an outline of the responsibilities of the Disaster Control Committee.

Chairman

Liaison with the Regional Director, or the Commissioner, through the Director of Local Government. Co-ordination of the Committees and warning of the public.

Deputy Chairman

Mobilization of manpower and transport. Public information.

Head of Engineering

Survey and forecast of possible disaster. Survey and control of utilities and engineering equipment. Access and debris clearance. Road clearance. Restoration of critical services. Damage estimates. Search and rescue. Fuel supplies.

Head of Medical and Public Health

Survey and control of nursing station and medical resources. Immunization program and epidemic control. Disaster patients care. Plans for the reception and care of inmates and patients of health institutions. Sanitation survey, garbage, sewage, and varmint control.

Head of Social Development

Accommodation survey, registration and inquiries. Evacuation when recommended. Emergency feeding, clothing, and lodging. Liaison with voluntary organizations.

Head of Police

Warning outlying areas. Maintenance of law and order. Emergency communications. Traffic and crowd control. Guidance of evacuees. Looting. Search and rescue. Radiological monitoring (in case of accident with radio-active compounds).

Head of Communication

Control of extra emergency communication equipment. Liaison with the RCMP, CBC, Government of the N.W.T. and any other agencies which operate any communication equipments. Surveying of existing communication.

Fire Chief

Search and rescue. Control of fire fighting. Location of alternative water resources.

The people may select other members of the community to assist in carrying out their responsibilities.

Location of the Disaster Headquarters

The Disaster Headquarters is to be located at the suitable place which the Committee has selected. If this place is destroyed or becomes unsuitable the Committee may select any other suitable accommodation as may be deemed necessary.

Warning of the Disaster Committee to Assemble

This should be passed on by telephone fan out. If

warning of a possible disaster is received, members of the Committees may be placed on progressive standby alerts. This should allow Heads of Committees to notify the members of the precautionary measures to be taken at each stage of alert. If telephone communications are non-existant the request for the Committee to assemble should be passed on by word of mouth.

Assistance

Scope

Minor disaster of a purely local nature i.e. localized fire or building freeze-up or etc. that can be rectified with local resources under direct control of the local authorities with minor assistance from government departments or other agencies where available should be the responsibility of the local authorities. Minor assistance may include the request for the use of a pump, bulldozer, or one or two vehicles or stretchers.

Request of Assistance

When it has been determined that the local resources under direct control of local authorities are found to be inadequate, requests for additional assistance should be made by the Regional Director to the Commissioner, normally through the Director of Local Government. Request for assistance should contain the following information;

- A statement that the emergency is, or will be, beyond the resources of the local authorities.
- If assistance is required, what essential stores and manpower should be provided.
- Is evacuation of part or all the community recommended? If recommended advise the location of the most suitable loading areas and the numbers involved.

Requests for the assistance of the Canadian Forces should only be made by the Commissioner. In an extreme emergency where time does not permit the formal exchange of correspondance the Regional Direc- would immediately be informed of the action as soon as contact can be established. If local Militia or Rangers offer their services, they do so as citizen volunteers until authorized to be called out by the Minister of National Defence.

Voluntary Assistance

Request for assistance from the Red Cross, the Salvation Army, or other volunteer or auxiliary service should be made by the Regional Director. If a settlement is to be used as a reception area for evacuees from another area that has suffered a disaster, the Regional Director should immediately inform the Chairman of the Settlement Disaster Committee of the approximate number of evacuees which may be expected and their estimate time of arrival.

The provision of services, materials and equipment resources from non-government sources should be approved by the Commissioner or the Regional Director and arranged for by the Head of Engineering. A record of the hours worked by the personnel should be maintained by the Engineer.

Aids towards the rehabilitation of persons and property after the emergency should be dealt with as a separate matter by Government of the N.W.T.

Local Warning of a Disaster/Emergency

Immediately a disaster has been declared a statement of this effect should be passed to the local radio station where applicable explaining the situation. Sufficient information should be given to avoid panic by local residents. The local fire siren should be sounded for three minutes to warn residents to turn on their radios for instructions. The sounding of the siren should be ordered by the Chairman or the Deputy Chairman.

Mutual Assistance

In the event of a civil disaster in other towns, villages, settlements, or camps; the community may be requested to assist by supplies, medical services, housing, rescue or hospitalization and welfare workers. The request should immediately be established at some suitable building which can be deemed suitable by the Chairman.

Social Development

The Disaster Social Development Centre should be established in some suitable place which the Committee has selected. If this accommodation is destroyed or becomes unsuitable the centre should be established elsewhere as directed by the Chairman.

Communication

No spare or unallotted communications equipment should be deployed without the authority of the Chairman. All users of the disaster communications systems should keep messages as brief as possible.

Police

If the Community is used as a reception area for other areas that have suffered a disaster, the head of the Police should ensure that only vehicles that have an "Official" sign or carrying outgoing passengers be permitted to travel to the airport or landing area. The restriction should be lifted when all evacuees have arrived.

Maintainance or Operational Log

In the event of any type of local or national emergency an operational log should be maintained by the Committee from the commencement of the emergency. The log should be prepared under headings of date and time event and action was taken.

Training

Short exercises should be conducted by the Territorial Civil Emergency Planning Officer from time to time to keep the Committee members familiar with their responsibilities. The exercise should emphasize; the organization of the Disaster Headquarters and the Social Development Committee to cope with the registration, feeding, housing,

(Continued on page 14) **EMERGENCY**

DISASTERS PAST AND FUTURE

Lecture given by Dr. Anthony R. Michaelis
Science Correspondent "The Daily Telegraph"

Natural disasters have always occurred on our planet, and will always continue, although during its last million years of history their number and severity must have somewhat decreased. To these natural catastrophes, have in recent years been added man-made technological disasters, still small and often local, yet in the foreseeable future likely to rival those due to natural causes.

In the last 100 years 9 million people died during floods, 1 million during earthquakes, and 1 million from hurricanes, typhoons and cyclones. Untold additional millions died from diseases, the direct result of these disasters, and from catastrophic droughts. Yet during these last 100 years, the world population was only a small part of what it is today. Now and entirely new approach to disaster rescue is urgently needed and outlined on the following pages.

Definitions

Before doing so it will be necessary to define the terms and to establish the particular aspects of disasters which come within human interference. I suggest the following definitions:

ACCIDENTS	1 — 1,000 people dead, or imminent danger of death
DISASTERS	1,000 — 1,000,000 people dead, or imminent danger of death
CATASTROPHES	More than 1,000,000 people dead, or imminent danger of death.

With regard to accidents the existing rescue services, such as local ambulances, fire brigades and civilian hospital facilities are adequate, at least in the Western World. Even such historic accidents as the collapse of the River Tay Bridge, the sinking of the *Titanic*, the crash of the R 101 airship, the Aberfan mining tip that destroyed a school, train collisions, aircraft crashes of an ordinary nature, pile-ups on motorways posed no exceptional problems to the rescue services. Most, if not all, could have been prevented.

This is not the case with disasters as defined above. Here are some contemporary descriptions of natural disasters during the last 100 years:

> "A wave from 50 to 72 feet high arose and swept with resistless fury upon the shores. The destruction of life and property will never be fully known — at least 36,000 lives were lost." *Eruption of the Krakatoa Volcano, August, 1883.*
>
> "Within 30 seconds, 50,000 men, women and children were killed, and the streets of St. Pierre were heaped with dead bodies, to be incinerated or buried in the ashes that fell from the fountain of flame." *Volcano, Martinique, May, 1902.*
>
> "Of its population of 400,000 nearly 300,000 were homeless. All the hospitals had been destroyed and the authorities were dragging the injured, sick and dying from place to place for safety. Exhausted firemen directed the feeble stream from two hoses upon a solid block of flames, their engines pumping their supply from the sewers. Thousands were roaming the no-longer existing streets, famished for food and water. Supplies were coming in by the train load, but the system of distribution was not in complete working order. They were on the verge of starvation." *San Francisco Earthquake, April, 1906.*
>
> "When the bund of the River Teesta was breached, the town of Jalpaiguri was submerged in 8-10 feet of water within 7 minutes and remained so for 48 hours. When the waters subsided it was like a ghost town, covered with mud, silt and sand. Vultures hovered overhead and swooped down on the dead bodies of people, cattle, cats and dogs, which littered the streets and the surrounding villages. Many lives were lost because of the failure to warn the inhabitants of the flood." *Floods in West Bengal, October, 1968.*

In each of these instances, such local rescue services as did exist were completely overwhelmed and powerless to bring support to the often uncountable number of victims. It is the purpose of this paper to discuss ways and means to improve this situation by bringing rescue services from neighbouring areas, indeed to bring them by modern air transport from all corners of the earth. Neither the prevention of disasters, nor the essential rehabilitation of victims, on the physical, mental and social plane, falls within the scope of this paper. Nor can the spread of communicable diseases, which have in the past reached disaster and even catastrophic proportions, be discussed here.

Finally a brief word about catastrophes, involving more than 1,000,000 deaths. Fortunately extremely rare, when we dismiss the last two World Wars and any future atomic conflict, natural catastrophes may prove to be utterly unpredictable. The fall of a giant meteorite on a large city is an event for which no statistics can exist. I shall return to another catastrophe, the Antarctic Ice Surge, later in this paper.

The Concept of International Rescue

Our planet is a restless one, not dead like the Moon; there are 3,000 earthquakes a day and about 44,000 thunderstorms every 24 hours. Two factors have made disasters worse and brought them forcefully to our

notice. The ever increasing speed of the population explosion means that present and future disasters will inevitably show a correspondingly greater toll of human life. Today knowledge of a disaster is flashed within minutes around the globe, and within hours detailed pictures appear on the television screens of hundreds of millions of viewers. "Every 23 days now we launch an International Appeal for help because of a great disaster" General N. Abut, Deputy Secretary General of the League of Red Cross Societies told me in Geneva recently.

The need to consider major rescue operations from an international point of view has been greatly strengthened in recent decades. Scientific advances in both seismology and meteorology now allow us with a fair degree of accuracy to predict the location of future earthquakes and of the great circular winds. WHERE, but not yet WHEN, is the present state of disaster prediction. A very large number of seismographs are distributed all over our planet and continuously monitored. Similarly satellite photographs of our atmosphere from above, give us a constant picture of major turbulences, where they build up, and in what direction they move. These pictures, and their rapid analysis, have undoubtedly saved more lives than any other disaster prevention technique. Although earthquakes have often small foreshocks, these may be followed by major disturbances of the earth crust so shortly afterwards, that no effective warning can yet be given. Only by close international collaboration can prediction be further strengthened, warnings issued in time, and when disaster strikes, rescue operations be organised on an efficient, modern and technologically adequate scale.

Up to now, disaster rescue and relief have come entirely voluntarily and in a completely unco-ordinated way. Given by the man in the street, through the Red Cross, Christian Aid, Oxfam, War on Want — to name only a few — they have been supplemented by Government Grants and by WHO and UNICEF. In 1970 alone, the Red Cross collected and distributed about £17 million in cash and gifts in kind. But that is no longer enough. Aircraft photographic reconnaissance, satellite emergency communications, helicopter evacuation, large plastic igloos for housing survivors, pipelines for drinking water, and large stockpiles in strategic warehouses for emergency supplies are only some of the modern rescue services that in this technological age should be automatically available for each and all disasters.

Only an International Rescue Organisation, IRO, having the same prestige as the Red Cross, and the universality of the United Nations, will be able to provide all these services and apply them within hours, whenever and wherever the need arises. The IRO, if and when it is established, can call on all military and civilian air transport, and will have advance knowledge what to send, and how much. An International Rescue Organisation is not a science fiction idea, although it was forecast as such. It is merely the wishful thinking by the thousands, and hundreds of thousands, of disaster victims of the next few years. If no IRO is set up during the next decade, their number will reach millions. There can be no doubt whatsoever that natural and man-made disasters will occur in ever more devastating magnitude. "We do not know who will die tomorrow, but we know exactly how many" is the famous dictum of a life insurance company. It applies with equal certainty to natural disasters.

Mistakes of Past Disasters

But the real need for an IRO is best proved by the many things that went wrong during recent disasters, supplies that came too late, warnings that never reached the victims, and gifts that were unsuitable. "For an emergency we need what we need, and not things people want to get rid of" Miss Shirley Robertson, the Assistant Director of the Relief Bureau of the Red Cross in Geneva told me. It is her duty to receive the requests for International Red Cross help and to dispatch them to disaster areas. Nobody's word could have more authority than hers. Here are some detailed examples of what went wrong during recent disasters, and what an IRO would have done, had it then been in existence.

Earthquake in Iran September 1, 1962

Extensive damage over a large area, 125 miles west of Teheran. Although massive help came from all over the world — a total of £800,000 was collected by the Red Cross — a month later, on October 9, the disaster victims were still 4,000 tents short. These were finally air-lifted by the American Air Force. Lamps and stoves for the coming harsh winter were still being locally purchased at that time.

IRO stock-piles would have easily met such demands, if they had existed at the time. Detailed reconnaissance of disaster needs on the spot, would be one of the most important functions of such an organisation.

Earthquake in Skopje, Yugoslavia, July 26, 1963

Over 1,000 lost their lives, 3,000 were injured, 170,000 were homeless. The Final Report of the Red Cross on this disaster states: "Due to the destruction of all communications with Skopje it was difficult to obtain precise information on the actual situation in the city after the earthquake and a listing of the most urgent needs." Within a week, the situation had completely changed. "Such a large quantity of relief supplies had reached Yugoslavia that a recommendation was circulated that for the time being no further shipments should be sent forward."

Waste, frustration, and the additional loss of lives, or at a minimum hunger, thirst and disease, are the obvious consequences of this type of situation, only too typical of many disaster reports. Communications are inevitably destroyed in all large disasters. After photographic reconnaissance from aircraft, communications with survivors or with its own experts parachuted onto the scene

would have highest priority by the International Rescue Organisation.

Even if all regular telephone lines have been destroyed, radio amateurs, the famous "hams", can ensure contact with the outside world. In more primitive areas, the IRO experts would have with them a communications man with a powerful short wave radio transmitter, to ensure keeping the regional headquarters of the IRO constantly informed.

Droughts in India, 1966-1967

Over 106 million people were affected by one of the worst droughts in recent history. The Final Report of the Red Cross on this disaster states: "Of the 130,000 tons of milk powder estimated to be required, only 43,000 tons had been announced or promised." The Indian Red Cross appealed for gifts of "milk powder, other protein rich foods in powder or extract form, baby foods and multi-vitamin tablets." Over £2.3 million were raised by 40 Red Cross and Red Crescent Societies, although "donors in their efforts to collect assistance were often faced with great difficulties due to the conflicting reports coming from India, which made the world public confused as to the actual needs."

This is what happened: "A generous donation of 10,000 tons of rice and 8,000 tons of fertiliser were sent by the Japanese Red Cross which could not be used." (They were sold locally and with the money milk powder was bought).

Floods in Tunisia, September-October 1969

540 dead, 261,000 homeless, 70,000 homes destroyed, caused by successive torrential rain storms.

"The extent of damage to the communication network is beyond imagination. Hundreds of kilometers of roads have been made unusable, railway lines have been torn up, the threat of unemployment hang over thousands," says the Red Cross Circular No. 408 issued in Geneva on November 16,1969. "At the present time, (two months after the disaster), part of the territory is still being provisioned by helicopters. Tents, blankets, clothing, footwear and food have been distributed to the homeless, but in still insufficient quantities. Thousands of tents, tens of thousands of blankets, tons of clothing and footwear, especially for children, cooking utensils and heating appliances are still lacking. The approaching winter can only aggravate the conditions; sugar and baby foods are needed."

This was the "forgotten flood", when it proved extremely difficult to rouse public interest. The Tunisian Air Force worked desperately with a few helicopters of its own, borrowed some from American Air Forces, and Spike Milligan posed by his painting to appeal for funds.

How different the picture would have looked if an International Rescue Organisation had been in existence and had taken charge. After aerial reconnaissance to find the extent of the flooding, communication would have been re-established over short wave radio or by satellite ground station. An appeal for helicopters would have gone out by the Regional Centre of the IRO and from near-by countries, like France and Italy, from the American and Russian fleets cruising in the Mediterranean, surely sufficient helicopters could have been assembled to establish a regular air-lift to evacuate the needy and to supply the survivors. If not within hours, at least within a day or so, the air-lift would have ferried massive IRO stocks of tents, plastic igloos, blankets, food, clothing and footwear across the water-logged roads. As an example such a full scale airbridge was launched by the Committee of the Red Cross (the organisation which looks after the sufferers from wars, whereas the League only deals with natural or man-made disasters) to land supplies in Biafra in June, 1968.

Iran Earthquakes, August 31 and September 1, 1968

10,000 killed, 4,000 injured, 15,000 homes destroyed.

According to the Ninth Report on Foreign Disaster Emergency Relief by the American Agency for International Development (1969): "The exact number of dead may never be known. Because of the danger of epidemics, rescuers gave up trying to recover bodies several days after the quake. Bulldozers were ordered to level the ruins, leaving bodies of the dead under them forever." "The extremely heavy casualties were blamed on the still unsuitable building practices." "Indeed thousands of lives might have been saved had other types of construction been used, but mud and timber have been the basic building materials in Iran for centuries."

An International Rescue Organisation would only deal with one of the three aspects of all disasters. Prevention by dam building, earthquake proof buildings or anti-locust measures would be just as much outside its scope as the inevitable rehabilitation which must follow the re-settlement of the disaster survivors. Only quick and efficient help, immediately following a natural or man-made catastrophe is the business of the IRO.

Nevertheless one would hope that once an IRO had been set up, the voice of its experts would be increasingly influential in pointing out disaster prevention, as well as in rescue and relief operations. In commenting on the effectiveness of these particular relief operations in Iran, the Ninth Report states that the following problems had arisen: "Initial failure of communications. Inadequate maps and insufficient information on the location of villages affected. Absence of roads and inability to maintain airstrips, lack of helicopters and airlift support. Reluctance to take relief materials to villages and hamlets located in the farther reaches of the mountain areas and to relatively inaccessible areas."

Regional IRO centres would have detailed information and maps, particularly of areas where frequent earthquakes were likely to occur. Says the Ninth Report: "What would normally be a once-in a-lifetime nightmare, has for the Iranians become a potentially recurrent horror with which they are obliged to live."

Earthquake in Peru, May 31, 1970

70,000 killed, 50,000 injured, 200,000 dwellings destroyed.

The earthquake provoked the fall of a gigantic cornice of ice from the upper glaciers of Huascaran, producing an avalanche of 80 million tons. It raced at a speed of 250 miles per hour down the valleys, burying whole towns and many villages. It was described by scientist "as the single geological phenomenon of greatest magnitude in recorded history." Details of the rescue operations were given in the Annex of Red Cross Relief Bureau Circular No. 447 of October 16, 1970.

It was the usual story of far too little, far too late, although eventually aid reached the survivors. "News of the scope of the disaster gradually started to come in by radio and other means. It was only 24 hours after the tragedy that reports came through of the total destruction of towns . . . Still now (4½ months after the earthquake) a large number of hamlets can only be reached by mules and in certain cases only on foot carrying relief supplies in sacks. Given to the Peruvian Air Force, 5,270 (only!) parcels were dropped by parachute. The total number of zinc sheets distributed was estimated to reach 65,000, used in the villages for roofing."

Nevertheless, three important innovations in rescue work were tried which the IRO, when set up, will undoubtedly adopt. First a special instrument aircraft, belonging to NASA, the American Space Agency, overflew the area affected and handed the photographs to the Peruvian authorities, 2 months and 6 days after the disaster!

Secondly 500 plastic foam igloos, each providing shelter for a family with 7 beds, were donated by the German Red Cross. They have excellent heat insulation and will last for several years, but they are still fairly expensive, costing £100 each.

Thirdly the Swedish "Catastrophe Force" of 62 engineers and technicians went into action for the first time, although only after lengthy delays. After their initial offer of assistance, it took two months for a tripartite agreement to be negotiated and signed between the Governments of Sweden. Peru and the United Nations. It took another month and a half before the first echelon reached Peru itself. Three mobile workshops accompanied the Unit, and finally it proved a great success.

There can be no doubt that thousands of lives could have been saved, had rescue and relief reached the isolated villages by air, as it would have done had an International Rescue Organisation been in existence.

Cyclone and Tidal Wave in East Pakistan, November 12-13, 1970

Estimated 1 million dead, destruction of homes uncounted.

If this was one of the worst natural disasters yet recorded, it was also the worst example of inefficient rescue operations. For several weeks afterwards, it was estimated that about 1,000 people were dying a day, simply because there was no mechanism to get to them the tons of supplies accumulating on and near Dacca Airport.

Neither the Pakistan Government, nor the international aid organisations, nor the foreign armed services were "under a single unchallengeable directorate to control all rescue operations." They had not "the ability to control the movement of men, materials and messages within the disaster area" and they had not "the possibility of securing rapidly the relevant expertise." These are the three most important elements in all rescue operations, after a disaster, according to Lord Robens, "who had thought deeply about the lessons to be learnt from the Aberfan disaster, where choked roads prevented essential rescue services to reach the scene, and where people clawed with bare hands at piles of rubble." Lord Robens was speaking at the British Association Meeting in Dundee in 1968.

Just how necessary the establishment of an IRO has become, and the proof for the increasing number of victims which recurring disasters bring to the same area, can best be documented by these East Pakistan floods. Six major cyclone disasters have hit East Pakistan in the last 10 years. Once in 1960, twice in 1961, again in May, 1963, and in 1965 36,000 people were killed. In November 1970, the estimated deathroll was one million.

There was thus plenty of warning that nature would strike again, and the Red Cross had purchased and erected a special radar for storm detection. Yet a few days before the disaster on Friday, November 13, it had been altered and was out of action. Another warning had however come from satellite cloud pictures of the tropical storm OPAL. But because of lack of local communications, this could not be passed on to the people in greatest danger. Another report about the failure of the radar warning states that only 3 weeks earlier a smaller cyclone, killing only a mere 300, had struck the same area and that then the warning system worked perfectly. Most of the villagers had however been left unaffected, and when the second warning came, it was to them another cry of "Wolf!" They did not bother to seek out their safety positions. Had they done so, 500,000 people might have been saved.

The German magazine "Spiegel" did not mince words in its first report about the catastrophe. "Nothing was achieved by the two tons of rice, blankets and drugs which the Boeing 707 of the German Luftwaffe was the first to bring to Dacca. They were brought across 10,000 miles in hours, but could not reach the needy a few miles away. They were moved to an open field next to the airport, and then found their way into the black market. Too much, too soon."

Cash donations, collected by the League of Red Cross Societies fared little better. A month after the disaster, its Secretary General, Mr. H. Beer, had to complain to the President of Pakistan, that the official rate of exchange, 10 rupees to the pound, was used instead of the

travellers cheque rate of 20 rupees to the pound. All donations were thus effectively halved in value, and many national societies, including the British Red Cross, delayed remitting the large funds collected for relief. What this meant in terms of human suffering, no one has yet estimated.

The sending of cash donations to countries afflicted by a natural disaster is a much debated question. A Red Cross Official in Geneva pointed out to me that it helped to start up again the hard-hit local economy, and because of absence of transport costs, a little money often went a long way. Besides it supplied the very goods to which the disaster victims were used. I maintained that, human nature being what it was, such purchases might easily lead to considerable profiteering, particularly if similar disasters had occurred in the same area before, and local commercial stock-piles had been laid down. Would it not be much better for the local Government to requisition such disaster relief as was available on the spot, and use the funds for purchase of supplies that could only be bought in the country where the money had been collected? In fact do not use British Red Cross money to buy saris and dhotis in Dacca, but get collapsible rubber dinghies in Britain, particularly as free transport by the RAF could have been arranged.

Even worse than the exchange rate was the report in the *Sunday Telegraph* 4 months after the cyclone. An international swindle involving relief supplies to East Pakistan had come to light and was being investigated by the Canadian Fraud Squad and Scotland Yard in London. American firms gave to a Christian Relief Organisation surplus goods, which would otherwise have gone to waste. The firms could then claim American tax rebate, as these goods were gifts to charity. The Christian Relief Organisation then sold these goods through London to the disaster areas at reduced prices, the finance for these involved operations coming from a fraudulent international investment fund.

As so often happens with voluntary gifts for disaster relief, many were completely useless. Tins of apple sauce, jars of honey, woolen socks, great coats and tents too difficult to erect, took up much valuable air cargo space, when water distillation units, collapsible rubber dinghies, even simple swim vests, should have reached the scene. "It was however better than during the Agadir earthquake (Morocco 1960, 17,000 killed) when washing machines were sent — but there was no running water" as Mr. J. Vittani of the Red Cross put it. When the IRO has been set up, detailed priority lists of urgently needed materials will be prepared in advance, and followed to the letter.

Only when modern technological tools were brought to bear, such as the IRO would use, for example the many inflatable life-boats donated by the Royal National Life-boat Institution and the warships *Intrepid* and *Triumph,* did real relief begin.

The lack of helicopters will always remain one of the greatest scandals during the East Pakistan floods. Apparently 50 helicopters of the Pakistan Air Force remained in their Western territories, only one local, and three German ones of the Luftwaffe, being available during the early days.

These deficiencies and scandals slowly filtered back to London. The Venerable Edward Carpenter, Archdeacon of Westminster, said that the suffering could have been avoided "for half the cost of Concorde, wisely deployed." He was speaking about "the feeling of guilt in the affluent west that in our highly technological age, capable of putting a man on the Moon, forces so agelong and elemental could bring about such a disaster." Voluntary help, on which so much depends at present, will never flow as freely again when people realise that their contributions are not as efficient as they had hoped.

Technological Disasters

The loss of life caused by faulty design of bridges, ships or aircraft, often coupled with human error, has so far been slight and would come by the definition here adopted, in the category of Accident. When a storm blew down the Tay Bridge in Scotland in 1879 only 85 people in the train on it were killed. When in April, 1910, the "unsinkable" *Titanic* went down in the North Atlantic, the deathroll was more serious, between 1,490 and 1,635 lost their lives, the exact total being never accurately determined in spite of 3 official enquiries. The worst railway accident occurred in 1917 in France with 543 dead, the greatest loss of life underwater being the accident to the *U.S.S. Thresher* off Cape Cod in 1963 with 129 men lost, and none of the more recent civil air crashes has killed more than 162 people. One real disaster has occurred in the past which can be blamed on faulty technology and human error, the explosion of ammunition in Halifax in 1917, when between 2,000 and 3,000 dead were estimated.

This comparatively harmless picture is however destined to change in the future, and technological disasters can be foreseen which may rival the deathrolls of natural disasters. Let us consider the advent of the Boeing 747, Jumbo aircraft. Two could collide in the air (deathroll about 900) and fall burning onto a sports crowd, either at a football match or a baseball game. Depending on their flight time since fuelling, at least several tens of tons of fuel would burst into flame, but again by itself this would hardly cause more than a few extra hundreds of deaths. The real danger of this disaster situation would be the ensuing crowd panic in which many thousand people might easily be crushed to death.

Then take giant tankers of over 250,000 tons. Whilst most of them carry only crude oil, it may on occasion be necessary for them to have a cargo of petrol or even liquefied natural gas. When the *Torrey Canyon* with a cargo of 120,000 tons of crude oil ran aground off the Scilly Isles in March, 1967, only one salvage engineer lost his life in the subsequent efforts to refloat her — however much damage the spilt oil caused on the beaches of Cornwall. How very different might be the situation if one of these giant tankers exploded, or simply sprang a bad leak, in harbour somewhere in the tropics. Lighter

oil fractions would catch fire immediately, as indeed they did during bombing attacks on oil refineries during the war, and even liquefied natural gas, normally at a temperature of minus 160 C, would quickly reach boiling point and if sparked, catch fire. Like the *Torrey Canyon,* this type of technological disaster would almost certainly be due to human failure or error.

Let us now briefly turn to land transport and its dangers, particularly of chemicals, like liquid chlorine, phosgene, strong acids and liquid oxygen. In spite of all safety precautions, and these have worked remarkably well during the past, the worst imaginable combination of circumstances could — and statistically speaking should — occur sometime. Again such an accident would by itself only cause a minor loss of life, unless it should happen near a human crowd, and turn it into a true disaster. Similarly a chemical factory accident, as nearly happened in West Virginia USA on July 24, 1969 when chlorine gas escaped in large quantities, could turn into a disaster.

The worst imaginable technological disasters will occur through human error and possibly through faulty design of atomic power installations. A number of very minor accidents are already on record. Suprecritical assemblies of fissionable materials occurred accidentally in the Los Alamos Laboratories, in a Yugoslav reactor and in the Oak Ridge Chemical Factory during 1958. Some of the victims recovered. Of potentially far greater danger was the graphite fire in the British Windscale reactor on October 10, 1957. Although filters in the chimney stack prevented most of the released fission products from escaping, some radioactive iodine found its way into the atmosphere. Increased radioactivity, above the normal background level, was measured as far away as Austria, a distance of 1,000 miles.

This is the measure of the danger which might affect thousands, if an atomic power station should undergo an "anomaly". So far the safety record of civil power stations has been outstanding, far above anything known in other similar industries; for example the death rate in British coal mines is still on the average one death every two days. But again, statisticians have warned that before the end of the present century at least one atomic power station, somewhere in the world, will exceed its design specifications and a serious accident or disaster may occur. Local dangers, apart from those directly employed in the atomic station, are likely to be much greater than those to whom radio-active winds will bring illness or death. Fall-out will be at a maximum in the country where the station is situated and will diminish according to wind direction and strength.

Elaborate emergency procedure exist, at least in Britain, but are being kept secret by the authorities, to prevent alarm amongst the population. But are there any procedures envisaged in Britain, or in any other country, for radio-active winds bringing the fall-out from a neighbouring country? And what is the mechanism to notify one country of an atomic anomaly in another? Is the International Atomic Energy Authority in Vienna immediately informed if such an event occurs? Are the dangers here envisaged so great and so grim that those who have studied them in detail feel that they are powerless to recommend any rescue measures?

There is another atomic danger from the accidental dropping of atomic bombs by aircraft during exercise flights. This is apparently by no means a very rare event. In 1966, following an American aircraft crash, a hydrogen bomb was accidentally dropped in the sea off the Spanish coast and an American B52 aircraft crashed in Thule, Greenland, in January, 1968, with four hydrogen bombs aboard. In both cases, elaborate, extensive and highly complex recovery operations for plutonium were immediately undertaken, and apparently prevented death and injury due to radio-activity. Official news of these two events was kept to an absolute minimum.

Technological advance, from which all benefit, brings with it some danger of technological accidents and possible disasters. But there is no reason why technological rescue operations should not be well planned, publicised and practised in advance to reduce loss of life to a minimum. After all, the discovery of fire was probably man's greatest discovery so far — and after many painful lessons he has learnt that an efficient fire brigade is a cheap insurance when his invention gets out of control.

Catastrophes

Natural events producing a catastrophe with 1 million dead, are extremely rare, and although their number will increase as the population explosion continues, there is no reason to believe that they will become a common event. Including for once pandemic diseases, only the following catastrophes have been recorded in recent history:

The Black Death (bubonic, pneumonic septicaemic plague)		75 million dead	1337-1351
Influenza epidemic		21 million dead	1918
Famine:	India	10 million dead	1770
	China	10 million dead	1877
	Russia	5 million dead	1919
Flood:	Hwang-ho River, China	4 million dead	1931
	East Pakistan	1 million dead	1970

It is doubtful if in prehistoric times anything but the Great Flood of Biblical times can be called a catastrophe; the population of our planet was simply too small.

One event that could easily cause a large catastrophe would be the fall of a giant meteorite onto a crowded city. About 2,000 meteorites of average mass of 100 kilograms fall upon our planet each year. The largest existing meteorite, weighing 50 tons, lies where it fell, in South West Africa; its volume is 9 cubic meters. But this is by no means the largest that collided with our Earth: the famous Tunguska meteorite, which fell in Siberia in 1908 was estimated to have weighed 1 million tons and to have exploded 400 times its own mass of rock, earth and water. Had it fallen onto any city, its impact would have been equivalent to a 1.2 megaton

hydrogen bomb. This is equivalent to 60 Hiroshima type atomic bombs or a pro-rata death roll of 5½ million. A somewhat smaller one hit the rocky slopes of the Alin Mountains in Eastern Siberia in February 1947, scattering meteorite fragments over an area of several square kilometers. Large meteorite craters, like the Barringer one at Winslow in Arizona with a diameter of 1.2 kilometers, and elsewhere, testify that such collisions have occurred in the distant past before there were any cities. They might occur again.

A quite different type of catastrophe, possibly the worst that could occur, and one that has apparently already happened several times in the geological past, is the Antarctic Ice Surge. A. T. Wilson published a paper in 1964 in which he postulated that at the beginning of each ice age, there is rapid but temporary rise in all sea levels of about 30 meters, caused by the sudden slipping of the whole Antarctic Ice Shelf into the surrounding oceans. He explained it by the gradual build up of ice in the Antarctic during thousands of years, until its own weight transformed the bottom layers into water under high pressure. This water acting as a natural lubricant allows the whole ice cap to slide off the underlying rocky structure, and "surge" rapidly outwards, forming huge floating ice shelves in the surrounding Southern Oceans.

Such surges of glaciers have been measured elsewhere at a rate of 0.1 km day. Apart from the cooling of the oceans and the gigantic tidal wave, causing ocean levels to rise by 20-30 meters all round the world, J. T. Hollin has suggested that such a surge would immediately double the brilliantly white reflecting surface in the Southern Hemisphere, now made up by the floating ice shelves, and the new snows on the Antarctic continent itself. The Sun's heat received would thus be greatly reduced, and this could well mean the beginning of a new ice age.

This is inded a fascinating theory to explain the observed recurrent ice ages on the Earth. The one frightening fact is the discovery of a layer of water at the bottom of the Antarctic ice shelf when it was drilled at Byrd Station. At present no one can say if an Antarctic Ice Surge will occur in a year or a 1,000 years from now. But there certainly seems to be a good case for spending massive research funds on this question, and even to initiate a study of possible counter-measures to induce gradual melting of the Ice Cap through dusting with black powders or by atomic energy as has been suggested by E. Hass.

The International Rescue Organisation—IRO

The essential concept of an efficient technological and world wide Rescue Operation is pre-planning and the stock-piling, before the disaster, of all the rescue supplies that will be needed. It will indeed be a long shopping list and some of the more obvious items such as collapsible rubber dinghies, water stills and pills, communication equipment by radio and satellite, have already been mentioned above. Much can be learned from the stock-piling done by military and civil defence services who have by now long experience of what foods are most suitable, which radio transmitters are most efficient, and what type of tent most easily erected.

These great rescue warehouses would be strategically dispersed around our globe, near the equator to cut down north-south flying time to a minimum. Geneva, Singapore and Panama may prove suitable, and the stock-piles should obviously be as near to an international airport as possible. Nine small warehouses exist, belonging to the League of Red Cross Societies, but unfortunately they may not always hold the correct supplies. "Their importance has somewhat diminished in recent years, because of air transport," Miss Robertson of the League told me recently. The IRO itself would not own aircraft but would, when disaster news is received, ask for free transport by either military, or civilian cargo planes. There is by now a well-established precedent, sanctioned by IATA convention, that such cargo planes are lent free of charge for disaster rescue work, and the prestige of the IRO would ensure that no misuse is made.

The IRO would have a regional network with a central disaster office in each continent. It would be a small office, whose main function would be information and communications. It would be amongst the first to receive news of a disaster, to alert its volunteer experts, and to channel requests for further help from the disaster to other regional offices. The office would naturally work on a 24 hour basis, and its location be well known to all governmental and military authorities of the region.

The first news of a disaster in its region might well reach it by radio, or through the ordinary news agencies, if disaster prediction had not already placed the centre on a stand-by alert. (Flood and typhoon warnings come today from satellite pictures, and earthquakes often have fore-shocks.) As soon as a disaster had been confirmed, a smooth and often rehearsed plan of operations would begin. Volunteer experts, doctors and engineers, with previous experience in disaster work, would be called up, and if necessary flown on a priority basis half way round the world, to the site of the disaster.

Rescue Priorities

An International Rescue Organisation would only deal with one of the three aspects of all disasters. Prevention would be just as much outside its scope as the inevitable rehabilitation which must follow. Only quick and efficient help, immediately following a natural or man-made disaster is the business of the IRO.

All disasters have a basic similarity and the IRO would apply its carefully planned list of rescue priorities in each case. They might run as follows:

• **Chain of Command.** On receipt of the news of a major disaster, the appointment of a Disaster Commander, the DC, must have first priority. Normally he would be a high ranking military officer of the country in which the disaster had occurred, someone familiar with terrain, customs of the people afflicted, and preferably trained in, or at least familiar with, rescue operations on the scale needed. If no such suitable DC is immediately

available, the Regional IRO Office might offer one of its own experts. The DC would have absolute power over men, materials, communications and supplies, whether indigenous or brought in from outside. He would, of course remain ultimately responsible to his own Government, or to the IRO. The DC would have a number of deputies, dealing with each of the following Rescue Priorities; where no such expert deputies are available, again the IRO would offer its own personnel. Only experience after several disasters would show how this chain of command would work and where there might be a need for improvement.

• **Reconnaissance** of the disaster area, to assess extent of devastation either from survivors, or if necessary by immediately sending its own disaster experts, engineers and doctors, to the scene. If necessary they would be dropped by parachute.

As precise information will be the most precious commodity during the first hours of any disaster, the DC or the IRO regional centre may well, as its first action, request from the local air force a photographic reconnaissance flight to obtain precise data on which to base its subsequent actions. Naturally voice radio contact with such a flight would give prior information, but photographs would be essential a few hours later to plan the siting of mobile emergency hospitals to locate evacuation routes and to find surviving land or waterways for the approach of rescue teams.

The pathfinders of the IRO would be its own experts, flown in or parachuted to the site of the disaster. Their function would not be to carry out any rescue at all, but to act as the eyes and ears of the DC or the regional centre who would by now begin to open the warehouse. Here again a planned and often rehearsed procedure would be essential to make sure that the right supplies go on the first planes. Naturally these would vary according to the type of disaster, small mechanical shovels for earthquakes, rubber dinghies for floods.

To take a technological disaster which may occur — for example the explosion of large tanks of chlorine gas. Here, after initial reconnaissance, first priority would be the provision of gas masks for the population, and none might be stored in the IRO warehouses. These may be available from other countries, and it would then be up to the IRO officers to consult their files where the nearest stock-pile of these was located. Most likely a central computer for all regional IRO offices would be the best way of recording names of experts, unusual rescue needs, and up-to-date records of the contents in all IRO warehouses.

• **Communications** with survivors or with the IRO disaster experts must have third priority. Even if all regular telephone lines have been destroyed, often radio amateurs, can for the first few days ensure contact with the outside world. In more primitive areas, the IRO experts would have with them a communications man with a powerful short wave radio transmitter, to ensure keeping the regional headquarters of the IRO constantly informed.

The International Telecommunication Union, the United Nations Agency dealing with all communications, is now drawing up specifications for commercial production of small portable ground stations especially for disaster areas which can reach communication satellites. Only "thin line" traffic of about 5-6 telephone channels would be needed to reach the affected country's capital, the Red Cross at Geneva and the United Nations at New York. Such ground stations, expected to be available within the next two years, and stock-piled by the IRO, would be parachuted to the site, and re-establish communications within hours. They might well be in use for weeks and months.

• **Evacuation of the Injured** and living survivors, in that order, must come next. Where helicopters are available, they will be ideal but the IRO itself could not own these most expensive and limited-range means of transport. In the case of wide-spread floods, collapsible rubber dinghies would be thrown out from low-flying aircraft, after having been loaded with them from the IRO's regional stock-piles. Obviously a two-traffic traffic plan would be established as soon as possible, ferrying out the victims, and bringing in return emergency supplies of whatever kind are most urgently needed. This would come under the co-ordination of the Communication officer, unless the disaster is of such magnitude or complexity that a separate traffic command for land, sea or air would be essential.

• **Mobile Hospitals** would by now, say 24 hours after the first news of the disaster, have been set up at safe rearguard positions. These 50-bed natural disaster hospitals and their equipment would have come from IRO reserves, the doctors and nurses, all volunteers, would have been flown in.

• **Disaster Survivors,** either in the area where possible, or at evacuation sites, would now receive full attention. If the disaster exceeds the resources of the regional reserves, extra help would have been flown in from other regions, according to the requests made originally.

• **Water** is top priority for all survivors. Small portable stills now exist which can convert sea water into fresh water, or if fresh water is available, but contaminated, water sterilisation pills by the thousands can be distributed. Stills and pills would of course come from IRO stock-piles. Where droughts take on disaster or even catastrophic dimensions, more drastic rescue operations should be mounted. Although not available on the surface, there may often be rich water layers deep below, as for example in the Sahara, where at a depth of 1,000 yards huge water reserves have been found. Drilling equipment for such an emergency could be housed in one of the IRO's central warehouses, be rented from oil drilling firms, or purchased from IRO funds.

For more local droughts, it might prove possible to lay 20 or 50 mile long plastic water pipes say in 5 mile lengths from a huge rotating drum strung below a helicopter. Small booster stations would be needed every few miles. This operation should not prove more difficult

than the petrol pipe laid from England to France during World War II from the famous "Conundrum", the floating and rotating drum towed by tugs.

• **Health and Sanitation** of the survivors must be a quite independent operation from the treatment of the injured. Vaccines can now be safely stored for years in the dry state and mass inoculation of survivors against cholera and typhus carried out easily by semi-automatic means. Mental health of shocked people is just as important as physical health. Special IRO volunteer experts would use all available media of communication for re-assurance of victims and keep up a constant flow of information to them, where they can obtain additional help, how to find lost relatives, and where to re-settle.

• **Food** would provide the least difficulty, once physical communications have been re-established. There is today a vast variety of storable foods, tinned, compressed, dehydrated or only concentrated, which could be distributed from IRO stock-piles. Local preferences, or idiosyncrasies would be well known at regional centres, and where language difficulties might arise, explanatory picture diagrams would be printed on the outside of food containers.

• **Clothing, Heating Shelter** should have lowest priority when aircraft cargo space is at a premium. Many more natural disasters occur in tropical areas than in higher latitudes but here again local conditions may make exceptions. Blankets and small portable oil stoves may play a vital role and may need to be flown in even before food, where disaster survivors are in danger of freezing to death. The high priority of communications between local experts and regional IRO centre need hardly be stressed in this context. Additional fuel could easily follow later by land or water.

At the recent earthquake disaster in Peru in 1970, 500 plastic foam igloos, each providing shelter for a family with 7 beds, were donated by the German Red Cross. Made by Bayer, Leverkusen, polyurethane foam is sprayed, at the site, onto a rotating hemi-spherical mould, the mass setting solid within the hour. Self supporting with 4 inch thick walls they have excellent heat insulation and will last for several years. They are still fairly expensive, costing £100 each, but may well prove the first of the modern technological replacements of the old tents.

These to rescue priorities are at present based on purely theoretical, commonsense considerations. Only real experience in the field of disaster rescue operations will show how they stand up to practical demands, and they will no doubt be modified by experience and by individual disaster requirements.

The Future

In Washington, the League of Red Cross Societies in Geneva really knows what disasters mean and what help is needed in each case. Unfortunately their, by now out-dated, constitution has prevented modern technological help. In case of a natural disaster in Country A, its government through the local Red Cross Society can appeal to Geneva for additional help. As I have said this now occurs on an average every 23 days, and when it does, the Geneva Headquarters of the League can appeal to all the other Red Cross Societies in other countries to help Country A. Money and relief supplies can then be collected around the world for dispatch to the disaster area. This is unfortunately a lengthy procedure when it comes to the saving of human lives in immediate danger.

Yet without the international and generous help from the World's Red Cross Societies the fate of disaster victims would have been grim indeed. If the Red Cross really wants the second century of its activities to be as successful as its first, then it must completely reorganise its disaster approach. It must insist on collecting money for pre-disaster planning and stock-piling of relief goods and on a far more authoritarian direction of relief missions in the disaster area. In fact it must build itself up into an all-embracing International Rescue Organisation.

Can it rise to the challenge and for once, and once only, collect by voluntary subscriptions a large enough sum of money, say £30 million, to set up three giant stock-piles of rescue and relief materials and maintain permanent regional IRO offices? When there has been a call on the stock-piles, their replenishment could come from the sums normally given for any specific disaster. Or could the sum of £30 million be raised for the Red Cross by the Governments who now give generously and unco-ordinately for each individual disaster? No doubt much of the £30 million could be found in kind, if the right government and military surplus articles were made freely available.

The first moves are afoot to bring about a more rational disaster policy and to avoid inefficiencies. The League of Red Cross Societies, Oxfam, Catholic Relief Services, World Council of Churches and Lutheran World Federation are now holding discussions about setting up a joint disasters operation office to avoid duplication of relief supplies and act as a co-ordination centre. At the United Nations level, the Economic and Social Council called for action on natural disasters during its plenary session in July 1971. One of the speakers was Dr. Michael R. Sacks, the Chief Programme Co-ordinator of the World Health Organisation. He said: "Sometimes the wrong medical and health supplies are dispatched. The health concerns, require urgent, immediate and effective action."

At present the Secretary General of the United Nations has an annual fund of £62,000 for all disaster relief, although the specialised organisations, like WHO, UNESCO, FAO and WMO, have on occasion used their own funds and experts to help.

In the case of the World Food Programme, part of FAO, this has amounted during 1962-1969 to £26 million in the form of food distributed to disaster victims. Similarly WHO has given substantial help to countries affected by natural disasters, and has recently for example distributed 40 million doses of cholera vaccine to 55

countries. It spends annually about £1½ million on emergency supplies from its own, all too meagre, budget.

During the last six months, the United Nations have appointed a Relief Co-ordinator with a small office staff in Geneva and it is hoped that their efforts will grow in the future. At the UN Conference on the Human Environment in Stockholm in June 1972, a global warning system was approved. It provides for a centralised system of information which would be helpful to nations threatened by "imminent ecological disasters" like a typhoon. This might duplicate the Center for Short-lived Phenomena at the Smithsonian Institution in Washington.

There remains, one final hope of efficient modern technological rescue operation in the near future, namely through the Military Medical Services of NATO. This International Organisation with its recently formed Committee on the Challenges of Modern Society has for some time now considered how it could help in the case of disasters, but has apparently not yet formulated any concrete proposals. If the Military Medical Services of NATO could form themselves into a united disaster rescue system, it would become the ideal nucleus of an International Rescue Organisation. No doubt political and financial difficulties would arise at first, but it would only need one efficient demonstration that modern technological rescue could be carried out by experts in areas outside North America, and the way would lie open to the IRO of the future.

The Great Flood of London

Perhaps the Great Flood of London is needed to catalyse Britain into action and become the first subscriber to the IRO stock-pile fund. Imagine the scene:

Air raid sirens were howling over London. During the dark winter morning most people thought it a mistake or a bad dream — yet the Thames, swollen by heavy rains, hit by a North Sea surge and a tide far above prediction, had burst the Embankment.

More than a million Londoners, living in the 45 square miles below flood defences were inundated, and the number of deaths at first uncountable. The early morning rush hour had caught large crowds in the Underground, from Hammersmith to Bow Road, from Mornington Crescent to Stockwell. There the deathroll was more certain, and the first estimates were in the tens of thousands. (Although there was a warning system, it had never been tried in public, and failed at the crucial moment). The disaster had immediate international repercussions. Being underwater, many central London telephone exchanges were out of order. The most exaggerated rumours were current in foreign capital cities.

Like all great disasters of the past, compassion found an immediate outlet in the despatch of relief goods to England. From the West came planeloads, with hundreds of wrecked car bodies. During the disastrous mud floods in California in 1968, it had been found that wrecked car bodies were ideal to strengthen flood defences. They were meant to rebuild the Embarkment on the Thames.

From the East, help was equally generous. Plane loads of flour and cement arrived at Heathrow and at Gatwick. As none of the unloading ground staff could read the labels on the paper sacks, they were stored in the open overnight. Further heavy rains produced a quite incredible mixture of flourpaste and liquid cement, as useless as it was difficult to remove to keep the runways open. Ridiculous? No more so than what happened during the East Pakistan Floods in November 1970. Had an International Rescue Organisation then existed, about half a million people could have been saved. Should an IRO exist if and when London gets flooded — and this danger will persist for years to come until a Barrage is built at Woolwich — quite different help would come to London, and it would be desperately needed.

Londoners would indeed have to look for help from abroad, as the British Government is of the opinion "that it is not necessary to arrange for the central stock-piling of relief supplies in the United Kingdom which is not vulnerable to major natural disasters". (Report by the Secretary General of the United Nations on Natural Disasters, May 1970.)

Disaster Statistics

According to the 11th Report, the latest available, on Disaster Emergency Relief issued by the U.S. Department of State there were 51 disasters (their designation) during the year July 1, 1970 to June 30, 1971. The number of people killed reached 522,212, the number of reported victims was 68,069,760 and the grand total of relief paid out from all sources was £500 million, or $1,215 billion.

These figures have, of course, varied during the years. They have shown, however, a marked increase over the yearly average during the period 1965 to 1971, when there were 50 disasters a year, 242,000 killed each year, the number of reported victims each year was 20,200,000, and the relief paid out from all sources was an annual average of £329 million or $822 million.

Some Great Accidents and Disasters

E = Earthquake F = Flood
H = Circular Wind V = Volcanic Eruption

Year	*Place*	*Type*	*Dead*
79 AD	Pompeii	V	2,000
1846-1851	Ireland	Famine and Typhus	1.5 million
1887	China	F	900,000
1887	China	E	830,000
1906	San Francisco	E	700
1923	Tokyo	E	250,000 and Injured
1942	China	Mining Disaster	1,572
1953	Netherlands	F	1,800
1953	Essex	F	119
1960	Agadir, Morocco	E	17,000
1961	Belize, Honduras	H	400
1962	Iran	E	12,000

Year	*Place*	*Type*	*Dead*
1963	Shopje, Yugoslavia	E	1,050
1963	Caribbean Area	H FLORA	7,190
1963	Hamburg	F	450
1964	Anchorage, Alaska	E	130
1965	Florida and New Orleans	H BETSY	76 and 21,000 injured $750 million damage
1965	East Pakistan	F	36,000
1966	Turkey	E	2,470
1968	Iran	E	12,000
1968	Costa Rica	V	1,700
1969	Caribbean Area	H CAMILLE	200
1969	Peru	E	35,000
1970	East Pakistan	F	1 million
1970	Luzon, Philippines	H YOLING	160
1971	Los Angeles	E	61
1971	Mozambique	F	Hundreds

(The number of dead is often only a rough estimate)

Selected References

BALCHIN, W. G. V. Natural and Man-Made Disasters, Strategies for Survival.
Presidential Address to Geography Section of British Association, delivered Leicester, September 6, 1972.
(Available from Professor Balchin, University College, Swansea, Wales)

HASS, E., Common Opponent Sought and Found?
Bull. Atomic Scientists, 1968, *November*, p. 8

HOLLIN, J. T. Wilson's Theory of Ice Ages,
Nature 1965, *208*, p. 8
Antartic Ice Surges
Antartic Journal of the United States, 1970, *Vol. 5*, No. 5.

LORD, W. A Night to Remember *(RMS Titanic)*
Longmans, London, 1956

MICHAELIS, A. R. International Rescue
Daily Telegraph Magazine, 1967, No. 163, *November* 17
Wanted, an International Rescue Service
Sunday Telegraph, 1970, *November* 22
Chaos after Catastrophe
Daily Telegraph Magazine, 1972, No. 380, *February* 11

MILLS, E. D. Emergency Technical Aid Services for Natural Disasters
IMPACT (UNESCO) 1966, XVI, No. 3
Natural Disasters, A Selected List of Publications
International Union of Architects, May 1971
(Available from E. D. Mills, 9-11 Richmond Buildings, Dean St., London, W.1)

PETROW, R. The Black Tide *(Torrey Canyon)*
Hodder and Stoughton, London, 1968

UNITED NATIONS, ECONOMIC AND SOCIAL COUNCIL and Specialised Agencies
A small number of special publications.

UNITED STATES, DEPARTMENT OF STATE, Agency for International Development
Disaster Emergency Relief, Annual Reports.

WILSON, A. T. *Nature*, 1964, *201*, 147.

EMERGENCY *(Continued from page 3)*

and evacuation of personnel affected by the police responsibilities; disaster patients; and the organization of the local community to cope with the possibility of becoming a reception area for another community which has suffered a disaster.

National Emergencies

National Alert Warning

This warning should be passed by the National Emergency, Government Headquarters and/or Canadian Forces, H.Q. Yellowknife to all northern communities over CNT, RCMP, DOT, ABC, Bell Telephone, DIAND, and the Government of the N.W.T. radio and other agencies with communication equipments.

Standard Procedures

If an emergency arrives or threatens to arrive, EMO should immediately;

- Get on with life-saving if needed.
- Assess the extent of the danger or the damage.
- Send for useful people to add to the EMO.
- Send off a message to the Region or to the Regional Director of Local Government in Yellowknife describing the emergency.
- Carefully write down a statement which can be read to the residents for their guidance.
- If outside assistance is needed write down the request in detail.
- If it look as if the emergency is going to last a long time, arrange for shifts at the Headquarters.
- Make sure that someone keeps a diary of events including a summary of important phone calls.

General Duties of the EMO

The EMO itself under its Chairman or Deputy Chairman has the primary responsibility for the conduct of community affairs during the emergency period. To this end it must;

- Establish adequate communications.
- Establish adequate headquarters.
- Arrange for flow or required information.
- Add to itself specifically qualified persons depending on type of emergency.
- Establish routines for meetings, shifts, reviews, reports, etc.
- Keep the public informed and/or instructed.

And without reservation, firmly manage and direct the affairs of the whole community throughout the duration of the crisis.

General Procedures

If the EMO finds itself faced with a prolonged emergency or thinks that it might be, then it will begin the compilation of resource survey.

Surveys are carried out by the Committee sub-group, i.e. the Fire Chief list fire equipment that could be used for fire fighting as an improvision.

However items such as transportation, particularly specialized equipment needed for movement of the sick or injured, may need special EMO attention.

It is useful to display lists of resources and their deployment by means of wall charts or blackboards. In any event the whole EMO must be made aware of important deficiences and plan to fill them.▲

SURREY COUNTY FLOOD WARNING*

Early Warning

A completely up-dated early-warning system and emergency plan linking all the country's services in event of serious flooding has been designed to strengthen co-ordination. A new approach to the problem of evacuation and welfare of people in affected areas has also been drawn up.

The emergency plan was born as a result of detailed studies into the problems pinpointed two years ago. Surrey police and fire brigade, the Thames Conservancy Board and all 23 district councils were involved with the county council in the studies, which were aimed at effective co-ordination of all major services.

Main strength of the plan lies in the frequency and thoroughness of the warning system. Based on information supplied by the Thames Conservancy Board, this comes as a series of weather flashes from the Meteorological Office representing three distinct colour-coded warnings.

The first alert, coded yellow, acts as a cautionary warning of a high degree of saturation on catchment areas or over heavily frozen ground which could result in flooding following further heavy rain.

Next comes an amber warning indicating that heavy rain has fallen, or is stiff falling, and that flooding is likely.

Coded red, the third and final warning, comes when the situation is rapidly getting worse and flooding is imminent. This is the stage at which people living in threatened areas would be alerted for evacuation.

Varying degrees of preparation will be taken at each stage and once the first alert is received by the police, warning is passed on to all local authorities concerned so that departments, such as highways, health, social services, supplies and education can be kept in touch with the situation.

The newly-shape organisation is geared to assist at emergency accommodation rest centres, welfare and information centres, and to help in feeding large numbers at short notice. Surrey police maintains accurate documentation on the whereabouts of people who have been evacuated so that precise information can be given to relatives.

Surrey police have the main co-ordinating role in the emergency plan and maintain close touch from headquarters with the Thames Conservancy and Metropolitan and Thames Valley police. They have the responsibility for warning both local authorities and the public of flood danger and any decision to evacuate an area must be taken by the chief constable.

Voluntary organisations throughout the county have offered to play their part in any emergency scheme and Surrey is fortunate in also being able to count on the support of about 15 voluntary civil aid units — the surviving form of old Civil Defence groups — which are active throughout the county.

A comprehensive communications network by teleprinter, telephone and radio links has been built up between county services since 1968 and a good deal of special equipment acquired which includes a fibreglass boat and an amphibious vehicle. Surrey Police Underwater Section's amphibious equipment is also available, should it be needed.

About £25,000 worth of special equipment newly-available to the county highways department includes three forward-control Land-Rovers, which have the engine raised so that the vehicle can safely plough through over 3 ft. of water. Additional radio equipment maintains the liaison with police headquarters, district councils and road depots throughout the county.

Use of Civil Defence sirens in case of floods

Londoners may hear the wail of air raid sirens again if the Thames reaches flood level (see page 13). More than 100 wartime sirens have been reactivated from Dartford to Kingston upon Thames and linked to a single pushbutton control. A three-blast warning will mean that basements along the Thames and adjacent places likely to be flooded should be evacuated.

More than a million families living in areas that could be affected will then be asked to listen to B.B.C. Radio 1 for further instructions. Both television channels have agreed to flash warning captions on the screen.

Local authorities and the police will have had earlier warnings to put rescue and salvage units into operation and Underground stations in some areas will be closed.

The early-warning system will be operated from the Ministry of Agriculture in Westminster. Once the water reaches danger level at Southend, a telephone call to the Ministry will put a complicated three-stage operation into action.

There will be a four-hour alert warning for the police and local authorities. If the situation gets worse there will be a two-hour warning to put rescue squads on stand-by.

The final warning will be at one-hour. There will be captions on television, full instructions on Radio 1.

"We may never need this alert system. It may not be used for a thousand years, but it is better to be alert all the time than sorry after the event."

The air raid sirens have all been checked. The Ministry said later: "the object really is to get people to realize that once these things go off, there is a danger. They will not be sounded unless this becomes a possibility." ▲

*(From "The Journal of the Institute of Civil Defence)

SEEKING NUCLEAR ARMS CONTROL

The Hard Lessons of SALT I

by

*John Gellner**

The first stage of the Strategic Arms Limitation Talks — SALT I, as it is beginning to be called in anticipation of further stages to come — was concluded by the signing in Moscow, on May 26 last, of a U.S.-Soviet Treaty on Anti-Ballistic Missile Systems and of an Interim Agreement and Protocol on Strategic Offensive Missiles. Also part of the package are a number of "agreed interpretations" and "common understandings". The whole represents the net result of seven rounds of bargaining (four in Helsinki, three in Vienna) that began on November 17, 1969.

After reading the texts, and going entirely by what they say, one can only come to the conclusion that the mountains laboured mightily to bring forth a mouse — and a rather sickly one at that. If it were not for the indirect, the imponderable as it were, results it may have. SALT I would have to be written off as yet another of those exercises in futility which arms-control negotiations so often are.

The anti-ballistic missile (ABM) pact limits the treaty partners, to two complexes of 100 missiles each, one round the national capital, the other round a grouping of land-based intercontinental ballistic missiles (ICBM). There are some further restrictions on the area covered and on the deployment of radar, but not such that they would interfere with what the two sides have or intend to have: for the Russians, the already-emplaced ABM system around Moscow; for the Americans, the *Safeguard* ABM installation at Grand Forks, North Dakota, which is under construction and slated for completion late in 1974. As things look now, the Soviets will probably thicken and modernize the ABM shield protecting Moscow, but neither side is likely to pick up its second option, which would be an ABM system defending a Soviet ICBM complex and a *Safeguard* installation ringing Washington.

All in all, the ABM pact amounts to an admission by the two powers that the chances for a successful nuclear first strike are so slight as not to be worth considering, the aggressor cannot save himself from being crushed by the counter-attack, the second strike, whether or not there are anti-ballistic missile defences. This is pretty plain. We do not know, of course, what Russian thinking on this point was earlier, but there could not have been any doubt in American minds — not after 1966, when the Soviets started deploying ICBMs and building missile-carrying nuclear submarines at an unprecedentedly rapid rate. The punch a nuclear force can deliver is often expressed in megaton equivalents (MTE), equal to two-thirds of the explosive yield of the nuclear weapons that can be counted upon to reach enemy territory. For some time, it has been unwritten U.S. military doctrine that the delivery of about 400 MTEs would result in the "assured destruction" of the Soviet Union.

The latest estimate by the International Institute for Strategic Studies (IISS) puts the present "maximum theoretical capacity" of the U.S. strategic nuclear forces at just under 19,000 megatons, and that of the Soviet Union at 15,000 megatons, or about 12,300 and 10,000 MTEs. Even though the figures for deliverable weapons would be less (not all nuclear submarines would be on station, not all ICBMs or bombers would be serviceable), no conceivable first strike, in whatever way executed, could reduce the weight of the inevitable counter-attack to less than 400 MTEs.

So, at least as far as the military balance between the two super-powers is concerned, the ABM is an irrelevancy. The standstill agreement negotiated under SALT I merely confirms this fact.

Problem of verification

One provision of the ABM pact is, however, worthy of note; it concerns verification, the problem that has bedevilled past nuclear-arms control negotiations. Article XII states that "each party shall use *national* technical means of verification . . ."; it "undertakes not to interfere with the national technical means of verification of the other party . . . (and) not to use deliberate concealment measures which impede verification . . .". This is important. The Russians, in particular, have, in their *Kosmos* space-vehicle series, tried out an earth-satellite destroyer that could sweep American reconnaissance spacecraft from the skies above the Soviet Union. They have now promised not to do so. Also, the formulation of Article XII is such that it may lend itself to adaptation to future nuclear-arms control agreements, perhaps (but this is very much open to question) even to a comprehensive test ban.

If there is as least some merit in the ABM pact, there is none in the strategic offensive missiles agreement — at least, none that would be readily discernible. There is

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something like a quantitative freeze in respect to missile-launchers, but at a level higher than that which the Soviet Union has reached. (The United States is already at the maximum level set by the agreement.) Even more significant — and regrettable — is that there are no qualitative restrictions to speak of.

The United States currently has 1,710 missile-launchers, 1,504 for ICBMs and 656 for SLBMs (submarine-launched ballistic missiles), in 41 nuclear submarines. This is also the total number allowed it under the agreement, except that the 54 oldest and most vulnerable missiles, the *Titan* ICBM, can be replaced with SLBMs, to a maximum of 710 in 44 submarines. The Soviet Union at present possesses 2,090 ICBM and SLBM launchers. Depending on which of two options open under the agreement the Soviets decide on, they can increase that number to 2,424 or 2,358 (the larger number would not necessarily give them a stronger punch). In any case, there must not be in the ultimate weapons "mix" more than 950 SLBMs in 62 submarines, or more than 309 of the most powerful land-based ICBMs, the SS-9.

At first sight, this looks like a bad deal for the United States, the more so as the Soviet land-based missiles are, in general, considerably more powerful than the American. This, however, overlooks other factors that tend to equalize — some would say, more than equalize — the odds.

First of all, the Moscow agreements do not cover manned bombers. Here, the United States is vastly superior, with 455 (if only the B-52s are counted) or 531 (if the somewhat dubious, because of their more limited range FB-111As are added) carriers to the Soviet 140. It is often argued that bombers would have a difficult time penetrating modern defences. This is a contentious question; it would lead too far to enter into it here. In any case, the U.S. bombers are just in the process of being equipped with a reputedly highly effective air-to-surface missile, the SRAM; the later versions of the B-52 will carry 20 of these each and the FB-111As six each. Since the explosive power of a SRAM is, according to reports, 200 kilotons, one B-52 would be able to deliver four megatons in 20 warheads, each of which is ten times more powerful than the Hiroshima bomb, while staying well outside the range of the close anti-aircraft defences ringing an important target (the range of SRAM is reported to be about 100 miles). Thus the least that can be said is that the manned bomber cannot be simply discounted as a nuclear-weapon carrier. It follows that the U.S. superiority in this category remains a factor in the general strategic balance.

Another factor to be considered is that the U.S. force can deliver from fewer launchers more warheads than the Soviet. This is because of the development, so far not matched by the Soviet Union, of multiple independently-targeted re-entry vehicles — MIRVs; each *Minuteman* 3 ICBM and each *Polaris* A 3 SLBM can carry three 200-kiloton MIRVs, each *Poseidon* SLBM ten 50-kiloton MIRVs. That these are relatively-low-yield weapons, at least by comparison with the mammoth Soviet ICBMs, is not all that important assuming — as one must — that either kind is meant to deter a first strike by the threat of retaliatory counterattack. Since the latter could logically be directed only against cities (if there had been a first strike, the enemy's nuclear-weapon carriers would be gone by the time the counterattack was launched), the yield would not greatly matter; either 50 or 200 kilotons is frightful enough. It is the more frightful as a single *Poseidon* submarine could conceivably hit 160 targets simultaneously. At the end of the current rearmament program, the United States will have 31 *Poseidon* submarines, with 496 launchers and 4,960 warheads.

This brings us to the principal failing of the offensive strategic missiles agreement — the absence of effective qualitative restrictions, which means that, where improvement and replacement of existing weaponry is concerned, the nuclear-arms race can go on unabated.

There is every indication that it will. Both the United States and the Soviet Union are working on a new supersonic strategic bomber (the Soviet Union has already flown one). The Russians are modernizing their fleet of missile-carrying submarines, both by replacing diesel-powered units with nuclear-powered and by developing an SLBM with a longer range than the now standard SS-N-6, the SS-N-8. They are also experimenting with multiple warheads, though apparently not yet independently-targeted. The Americans, for their part, are in the process of updating both their *Minuteman* ICBM and their ballistic-missile submarine forces. They also intend to replace the ten oldest nuclear submarines, which are not slated for conversion from the *Polaris* to the *Poseidon* missile, with the new *Trident*-class submarines, which will carry the first SLBMs of intercontinental range. Finally, the accuracy of both the American and Soviet missile warheads is continuously being improved by better guidance systems. Much research and development work is also being done on manoeuverable warheads that would be able to evade ABM defences.

In sum, the offensive strategic missiles agreement can be called an arms-control measure only if one interprets that term very broadly. It *does* put an upper limit on the number of missile-launchers the two super-powers will have, and it *does* establish a rough equilibrium between American and Soviet capabilities in this field. On the other hand, at the end of the life of the agreement in May 1977, the offensive nuclear forces of both treaty partners will undoubtedly be quite a bit stronger than they are today. Their "overkill" capacity, already tremendous, will be greater still. One cannot know, of course, but a case could certainly be made for the contention that this increase in strength would not be much greater without a limiting agreement, so-called.

So, if one took into consideration only the hard-and-fast results attained, the final verdict on SALT I would have to be that it represents at best a tiny step in the direction of nuclear-arms control. It does not even touch the issue of nuclear disarmament.

Accomplishment in talks

As for the less obvious achievements of SALT, the one that should perhaps be classed as the most important is that the two super-powers persevered in negotiating for two-and-a-half years until they reached the sort of agreement that was sealed in Moscow last May. They did so in spite of all the difficulties that emerged along the way, and despite recurrent deadlocks, especially in the earlier stages of the negotiations. If one remembers how far the two sides were apart, even on basic principle, this was indeed an accomplishment.

For instance, Moscow's understanding of what are "offensive strategic weapons" differed sharply from Washington's; the Russians wanted to include in this category every type of weapon that could reach the territory of the U.S.S.R., that is, among others, the so-called "forward-based systems" (FBS) — in essence, American tactical airplanes based in Europe or on aircraft carriers. This would have weighted the scales in favour of the Soviet Union, which has no FBS and would thus have been able to offset these weapon systems of rather limited value with additional, fully effective ICBMs or SLBMs. When the Americans, naturally enough, demurred, the Russians proposed that the issue of offensive weapons be dropped from the agenda altogether. It took infinite patience, an unconscionable amount of time, and above all readiness, on both sides, to compromise, before problems like this one were got out of the way.

SALT I, however meagre the results, was thus for the two super-powers at least a good exercise in dealing with one another in concrete terms (as distinct from the sweeping pronouncements and totally unrealistic proposals for complete disarmament in which the Soviets, particularly, indulge in the United Nations) on matters of arms control. It is to be hoped that this will have a beneficial effect on other negotiations that are forthcoming, on mutual and balanced force reductions in Europe (MBFR), on a comprehensive nuclear-test ban, and, of course, on the continuation of the strategic-arms limitation talks, SALT II. It would be just as wrong to underestimate this particular intangible result of SALT I as to overestimate it. The two delegations, and in particular the delegation chiefs, Gerard Smith for the United States and V. S. Semenov for the Soviet Union, who have faced one another across the conference table for more than two and a half years, have reportedly established a certain *rapport*. This, too, is an imponderable, which one of these days could be of importance.

Effect on NPT

Nor should the effect SALT I may have on the fortunes of the 1968 Nuclear Non-Proliferation Treaty (NPT) be overlooked. It has been called discriminatory by the non-nuclear weapon states, and so it is, at least for the present. Still, there is Article VI of the treaty to act as a palliative. It binds the nuclear-weapon states, the "haves" so to speak, to "pursue negotiations in good faith on effective measures relating to cessation of the nuclear-arms race at an early date and to nuclear disarmament . . .". This is, in fact, the essence of the NPT. It asks the "have-nots" to refrain from aggravating the problem by rushing to get nuclear weapons too, while the "haves" attempt to bring about nuclear disarmament.

At any rate, this is the idea. One can — indeed one must — be sceptical about its ever being translated into practice. Still, even if Article VI did nothing but assure the non-nuclear weapon states that the military superiority the nuclear powers have over them at present will not get greater still, it would achieve much of its purpose. On the other hand, if the three nuclear powers that have acceded to the NPT did not even show that they were trying to comply with Article VI, the floodgates of nuclear proliferation would be bound to burst open eventually. After all, a number of countries that would be capable of providing themselves with nuclear weapons have not signed, or have signed but not ratified, the treaty. For the present, they are still on the fence. Their decision will no doubt, at least in part, depend on whether the nuclear powers uphold *their* side of the bargain, and to what extent.

This is why both Moscow agreements make a point of stating that they represent only a first step on the road to nuclear-arms control. Thus Article XI of the Treaty on Anti-Ballistic Missile Systems says: "Each of the parties undertakes to continue active negotiations for limitations on strategic offensive arms." And Article VII of the Interim Agreement on Strategic Offensive Missiles states: "The parties undertake to continue active negotiations for limitations of strategic offensive arms. The obligations provided for in this interim agreement shall not prejudice the scope of terms of the limitations on strategic offensive arms which may be worked out in the course of further negotiations."

The vital interest both the United States and the Soviet Union have in keeping the NPT operative — and making it universal, if this were only possible — enhances the chances of SALT II, which is now certain to follow SALT I (and may be under way by the time this magazine is in the reader's hands). Such success will admittedly be more difficult to achieve than in the case of SALT I. In the latter, the objective, perhaps not from the beginning but certainly from the time the two sides came down to brass tacks, was to establish force parity between the two super-powers and thus to provide a basis on which future understanding might be reached. (This, incidentally, will have to be done in MBFR as well if it comes to negotiations on this subject, as now seems likely; the thorny road trodden in SALT I cannot be avoided.) The next step is to apply the principle of parity to gradual, balanced reductions of armaments.

This task will be tackled in SALT II. It will no doubt be an extremely difficult one. Reductions of armaments will have to be related to each side's perception of its security requirements, and these are quite different in many respects. Under such circumstances arriving at acceptable trade-offs will pose enormous problems.

(Continued on page 20) **SEEKING**

WARSAW PACT MILITARY POWER*

The British Atlantic Committee, a voluntary organisation affiliated to the Atlantic Treaty Association, recently published in its Newsletter a study on Warsaw Pact military power. As this is a subject of considerable current interest, we reproduce the study below with the kind permission of the British Atlantic Committee.

The steady increase in Warsaw Pact military power can quickly be ascertained by a brief look at its components in 1972. In the strategic field the growth in recent years is well known. The Soviet Union obviously seeks to achieve at least strategic parity with the West, and the results thus far have been spectacular. Her ICBM (intercontinental ballistic missile) launchers now number about 1,400, exceeding by one-third the comparable US force of 1,054 launchers. In addition, the Soviets have over 500 IR/MRBM (intermediate range/medium range ballistic missile) launchers positioned to strike targets throughout Western Europe. While this force is declining, over 100 of the newer SS-11 missiles which can be employed at all ranges from medium to intercontinental, have been deployed at some IR/MRBM sites. These SS-11's offer a more flexible range of planning options and would also permit an emerging and hostile China to be taken into account as well. Much has also been said about the new 'silos' in the USSR, which may be designed to house a new or larger missile than the big SS-9's which already enhance considerably the striking power of the ICBM force. The purpose of these silos is still unclear, but they do pose an added question about Soviet strategic goals. Do they seek parity, or something more?

A look at the strategic equation is not complete without consideration of the other elements. As for submarine-launched ballistic missiles, the West still maintains a clear edge. But the Soviet building programme is in full swing, to enlarge the present force of about 60 ballistic missile submarines, of which about 30 are the new Y-class. Turning out about eight Y-class submarines annually, they should have up to forty such big boats in another year, and there is no way of determining when they intend to stop. By way of comparison, the US has 41 submarines of the Polaris/Poseidon type and has stabilized its programme at that figure. After mid-1973 the Soviet ballistic missile submarine force will total about 70 submarines.

The Soviets are still behind in long range bombers. Here again, they are building, and will probably have a new, highly advanced variable-geometry wing bomber in service within two or three years. This bomber could also support naval activities.

As a final aspect of the strategic picture, the ABM (anti-ballistic missile) system around Moscow deserves mention, and must be taken into account in the strategic balance sheet.

Despite any quantitative restrictions imposed by SALT agreements, the Soviets can be expected to improve steadily the quality of their strategic nuclear forces.

Maritime capabilities

Comparing Soviet maritime capabilities with the West, there can be no doubt that Soviet expansion has been rapid and sizeable. Moreover, it is clearly an on-going expansion, which raises the question of final goals. The Soviet fishing fleet is the largest in the world. The merchant fleet is modern and growing. But it is the Soviet Navy which has most dramatically expanded and improved, to a position where it is now capable of taking the initiative or reacting in any sea area in fulfilling its various roles.

The naval emphasis has been on modernisation and armaments. In addition to the ballistic-missile submarines already mentioned as a component of the strategic strike forces a general improvement of the already formidable submarine force is continuing. Nuclear powered submarines are replacing older models at the high rate of about sixteen a year, even though their total number of nearly 110 has already surpassed the nuclear-powered submarines of NATO. Not only are these submarines designed to attack Western missile-launching submarines, they are increasingly suited for anti-carrier missions and for antishipping roles directed against NATO's vital sealines.

On the surface of the sea, construction of the KRIVAK destroyer, the most heavily armed warship of her size in the world, is gaining momentum and underscores Soviet interest in the further development of their main surface force.

Improvements in anti-submarine warfare and in air-defence of naval vessels have taken place. Soviet amphibious capabilities have also been augmented. Perhaps most significant in the analysis of Soviet naval power is the expansion of their system of forward support facilities, including those needed for air support. Additionally, it is known that the Soviets have laid down the hull of a large new ship, possibly an aircraft carrier. This new development raises still another question about ultimate objectives.

In view of the fact that the USSR, in contact with NATO nations, does not depend on sea lines of communication, the Navy seems designed to promote Soviet interest world-wide and to support Soviet power policy.

The strategic and naval forces are areas where the improvements in military posture have been the most

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striking, and they have for this reason received most attention. These two fields have been almost exclusively *Soviet* programmes which have not involved the other countries of the Warsaw Pact. But there is no doubt that today the predominant component of Soviet and Pact military power remains the imposing Ground Forces with closely integrated air support. Here too, improvements are taking place, less spectacular, but equally significant. And these improvements are underway not only in Soviet Ground and Tactical air forces, but in other pact countries as well.

Standardization of forces

The Soviets have more and more recognized the great military potential of their allies, and, especially after the Czech crisis, are arming them with some of the best Soviet equipment. The degree of standardization already achieved in all the Pact forces is nearly universal. The more than 165 ground divisions of the Soviet Union can be viewed as having a supplementary component of about 60 divisions from non-Soviet Warsaw Pact countries. Of these 225 divisions, about 175 are combat ready. More than 80 per cent of these ready Warsaw Pact divisions face NATO, and less than 20 per cent are opposite the People's Republic of China. The continuing build-up along the Chinese border has been accomplished thus far without weakening the forces opposite NATO in Europe.

While the manpower strength of the Pact ground forces may be levelling off, modernization of equipment and command and control systems continues. New equipment stresses offensive capabilities, nuclear and non-nuclear, by improving mobility, fire power and shock action. In addition to new amphibious armoured personnel carriers and more artillery, new mobile missile launchers are being introduced. The mainstay of Soviet ground power, the modern T-62 tank, has greatly increased in numbers. The USSR now has more of these modern tanks than the total of all NATO tanks in Europe. Trial production of a new medium tank is already underway.

The total aircraft strength of Soviet air forces is now about 11,500. In addition there are about 2,500 aircraft in other Pact air forces.

Soviet aircraft which can be brought to bear on the land battle have further increased during the last year, and new models continue to replace older one throughout Warsaw Pact air forces.

Throughout this on-going effort at improvement, and in some cases expansion, the Soviets have not neglected their pre-occupation with air-defence, both of the homeland and their armed forces. Here again, the other Warsaw Pact countries form an integral part of the air defence organization for the Soviet Union. Better airplanes and new and improved missile systems have been introduced.

Summing Up

To sum up:

1) Strength and capabilities of Soviet and non-Soviet Warsaw Pact forces generally continue to grow. The on-going development and consolidation of Warsaw Pact military power is highlighted by great efforts in modernization of fully standardized equipment and control systems.

2) The strategic nuclear posture of the Soviet Union continues to improve, concentrating on refinement of missile weaponry. Under the SALT agreements, the ICBM force will be stabilized at the current level and within the terms of the same agreement, the Soviets are expected to improve rapidly their Ballistic Missile Submarine capability. IR/MRBM systems show a declining trend which is offset by other, more sophisticated systems.

3) Maritime capabilities are improving. Growing emphasis is placed on the use of Soviet naval forces in operations against NATO strike forces and in an anti-shipping role, as well as in support of Soviet power policy and expanding world-wide interests.

4) Soviet ground and air forces, substantially augmented and supported by other Warsaw Pact forces, continue to be strengthened by large scale introduction of modern equipment for either nuclear or conventional operations. Mobility, fire power and shock action guide their armament concepts.

Air forces in the areas facing Central Europe and China have been further augmented.

5) The Soviet posture on the key strategic flank areas of NATO continues to develop, most openly in the Mediterranean.

6) Space operations, already concerned with military support systems, may add a new dimension to Soviet capabilities in the not too distant future.

Throughout this review of the current state of Soviet and Warsaw Pact military strength and capabilities, the obvious question is raised repeatedly: where are they going, and how far? Soviet long-range goals are not known to have changed. How does their military posture support these goals? Is there consistency between the continuing build-up of military power and the concept of 'peaceful coexistence'? ▲

SEEKING *(Continued from page 18)*

In a recent issue of *Newsweek* magazine, a U.S. official was quoted as saying that "progress will be slow". "Compared to SALT II, SALT I is going to look like a lightning process," the article declared. This is probably true, though regrettable — and perilous, if for no other reason than that, with every year that passes without substantive progress toward nuclear-arms control, the danger of nuclear proliferation increases sharply. Still, it is too early to say what will happen at SALT II. It is certain that, if it has come about at all, it is because there was SALT I, and this in itself is something to enter on the credit side of the ledger. Where arms control is concerned (let alone disarmament, which has not even been tackled yet in earnest), one has to be thankful for small mercies. ▲

EMG. X

PERIODICALS,
UNIVERSITY MICROFILMS,
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